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TISH ASSOCIATION, WINNIPEG, 1909

Excursion to St. Andrew's Locks on the Red River

Saturday, August 28th, 1909

C

A. R. Dufresne, Esq., has kindly consented to act as guide for the party.

Application for Excursion Tickets must be made at the Excursion Counter in the Reception Room, not later than 2 p.m., on Thursday, August 26th.

For Time Table see Back of Cover.

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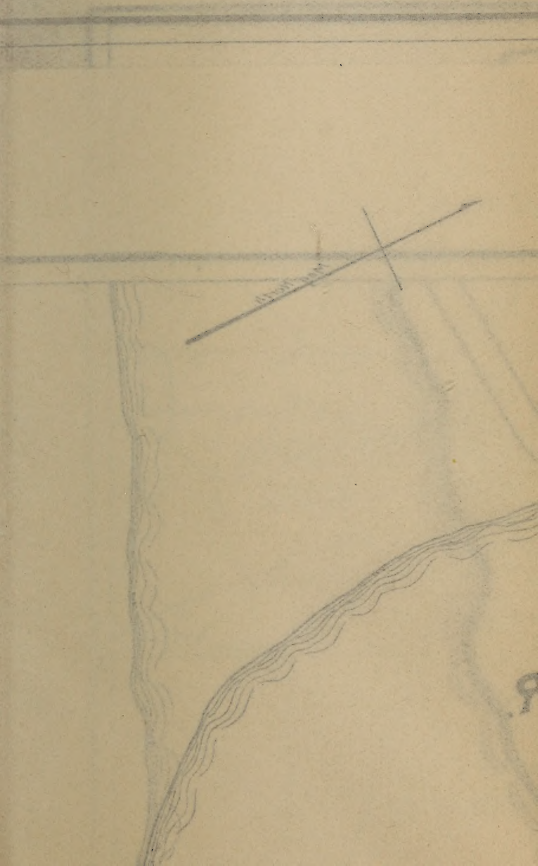
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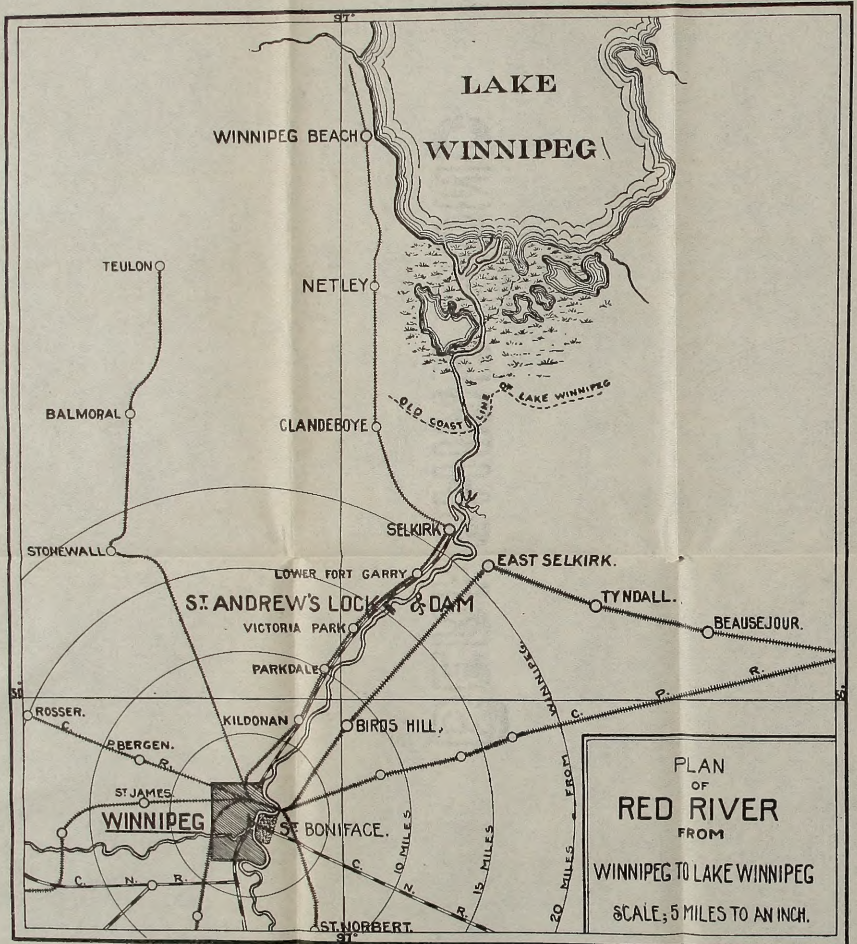
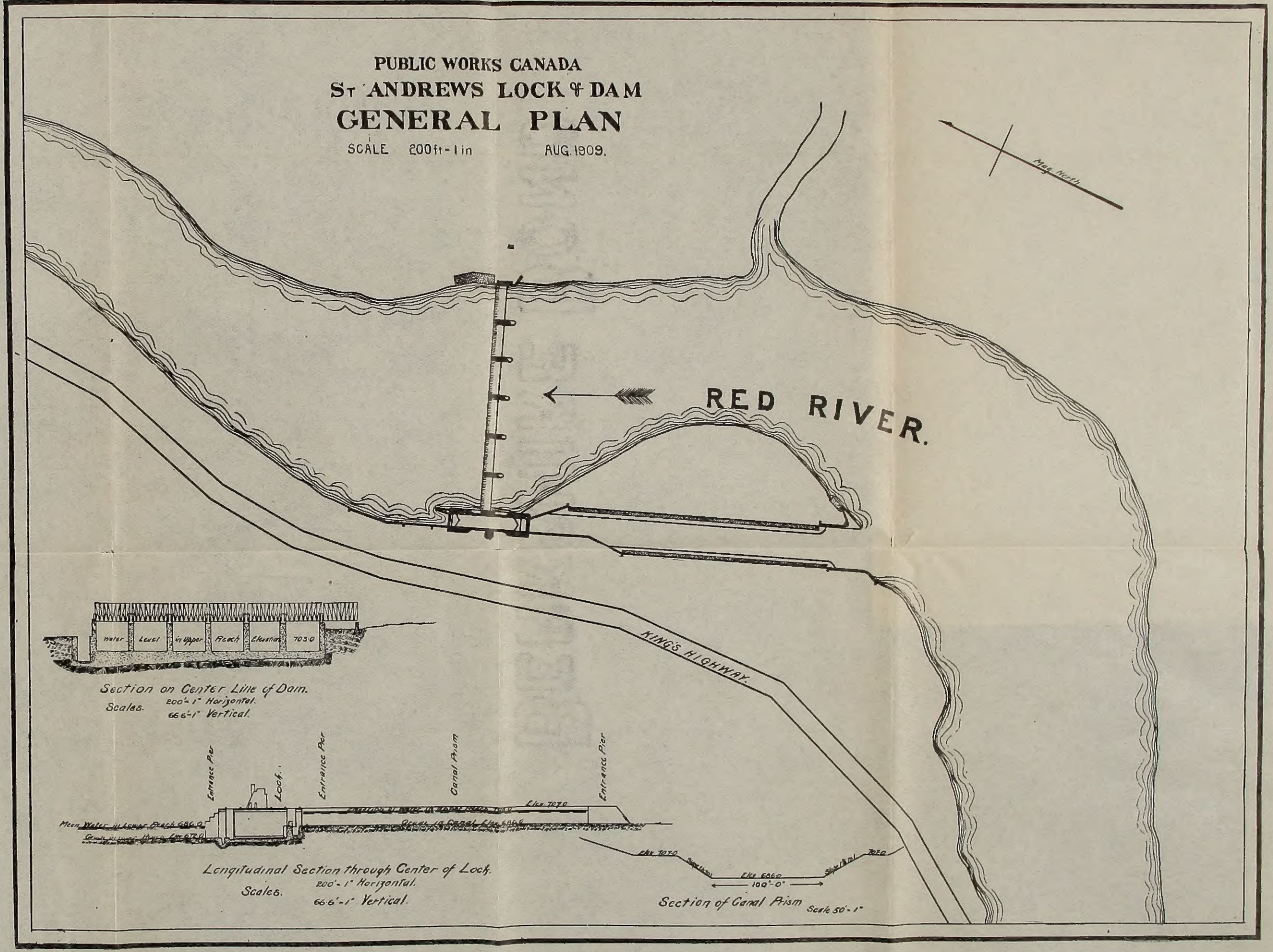

PLAN OF RED RIVER FROM WINNIPEG TO LAKE WINNIPEG

SCALE; 5 MILES TO AN INCH.


PUBLIC WORKS CANADA

ST ANDREWS LOCK & DAM

GENERAL PLAN

SCALE 200ft - 1in AUG. 1909.

Section on Center Line of Dam.
Scales. 200' - 1" Horizontal. 66.6' - 1" Vertical.

Longitudinal Section through Center of Lock.
Scales. 200' - 1" Horizontal. 66.6' - 1" Vertical.

Section of Canal Prism Scale 50' - 1"

The St. Andrews Lock and Dam

By A. R. Dufresne, Esq., District Engineer,
Department of Public Works,
Dominion Government.

In connection with the widespread interest now taken in Canada in the development of inland waterways for navigation purposes, it may be noted that there are rapidly approaching completion certain improvements on the Red River that will bring into close communication, by water transportation, the resources of Lake Winnipeg, with the City of Winnipeg.

Lake Winnipeg is distant 52 miles north of the City of Winnipeg, and has an area of some 9,460 square miles, being the fifth largest lake in Canada. The principal known resources on the lake are Fisheries, Timber and Minerals.

At the present time, navigation on the Red River, between Lake Winnipeg and the City of Winnipeg, is interrupted by the shallows in the St. Andrews Rapids, occurring in a distance of some ten miles, in which distance there is a fall of 15 feet in the river slope. By the construction of a Lock and Dam in the river, below the St. Andrews Rapids, it is proposed to raise the water above that point, a height of 21 feet, thereby flooding out the rapids and increasing the navigable depth in the channel of the river above the rapids.

The St. Andrews Lock and Dam is located 20 miles, by river, below Winnipeg.

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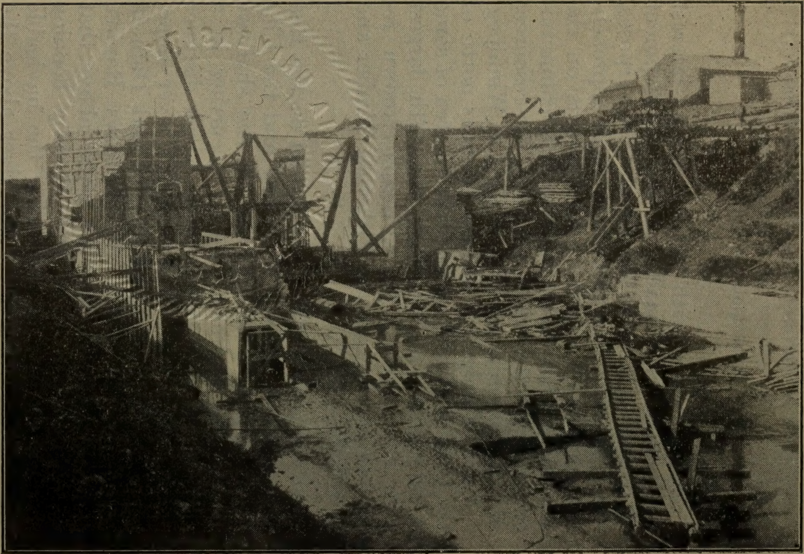


Construction of Locks, St. Andrews Rapids, Red River.

APR 25 1956

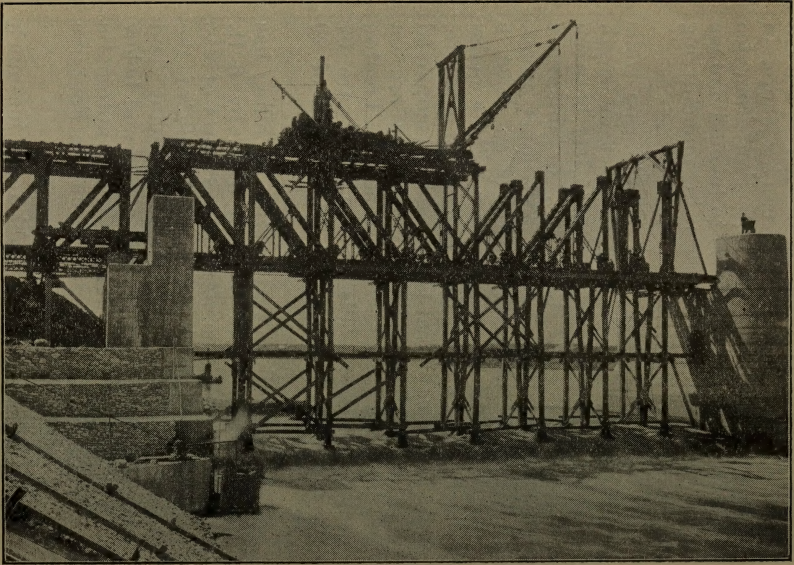
THE LOCK AND CANAL

The Lock has been located in a curved reach of the river, on the convex shore, in order to secure better protection from ice drift during floods, and also to take advantage of slack water for vessels in manœuvring for entrance.

The Lock between ends of extension walls is 290 feet in length, and 215 feet in length between hollow quoins, width 45 feet between vertical walls and total lift, or difference between elevation of lower and upper pools, 21 feet. A navigable depth of at least 9 feet at periods of lowest water will be maintained. The Lock is built entirely of concrete, some 17,000 cubic yards having been employed for this purpose. The foundations are on the local magnesian limestone of Trenton formation. The walls of the Lock are 37 feet in height and have a base width of 20 feet.

The side wall culvert system of filling has been adopted, there being a 5 ft. by 6 ft. culvert in each side wall with 8 ports of 2½ feet diameter leading into the body of the Lock from each culvert. The filling and emptying valves are located above and below each set of Lock gates and are automatic cylindrical valves, adapted from the Fontaine cylindrical valve used in France.

These valves are of special interest inasmuch as the working parts are not subject to pressures due to head and the valve will be therefore easy to manipulate under the maximum head of 21 feet.



Erection of Steel Work, St. Andrews Locks, Red River

The Lock gates are of the solid, built up, timber type, constructed of British Columbia fir and Southern oak. A number of 2½-inch vertical bolts run through from top to bottom and in addition each frame is dowelled with oak pins, and cast iron wedge blocks are inserted between each timber.

The gates are further reinforced by built-in girders to resist shock from vessels. Each leaf of the upper gates weighs 90 tons, and each leaf of the lower gates weighs 65 tons.

The gates are stepped on gun metal pivots and are anchored to the masonry by anchor bars imbedded in the concrete.

The gates mitre on 18 inch by 18 inch by 26 feet long oak sills, bolted to the concrete by 7 feet long anchor rods.

In the event of its being found necessary to unwater the Lock to effect repairs, this can be done by putting in stop logs at the upper and lower end of the extension walls, special provision having been made for this purpose by putting in checks in the masonry.

The guide piers at the lower entrance to the Lock are concrete walls of a gravity section, built on prepared rock surface, the west pier being 353 feet, and the east 43 feet in length.

The guide piers at the upper entrance are of a reinforced concrete type with spread base. These piers are built on closely cemented gravel and boulders and are 27 feet in height.

The upper canal is 1200 feet in length, bottom width 100 feet, and side slopes of 1 on 1½. Bank protection of broken stone is laid in a prepared trench to prevent wave erosion.

At the upper end of the canal are the upper entrance piers, constructed of concrete, the pier on west side being of a reinforced concrete type similar of section to those at head of the Lock.

The pier on east side of upper entrance is constructed to withstand ice shoves during spring freshets.

THE DAM

A particular study was made of the conditions of the river with a view to the adoption of a type of dam which would interfere, as little as possible, with the regimen of the stream during freshet period.

The Red River has a drainage basin of some 63,400 square miles and takes its source south of the International Boundary. The River has a discharge varying from 4,000 to 80,000 cubic feet section from periods of low water summer discharge to spring freshets. The conditions during the spring freshets are further aggravated by ice gorging in the lower portions of the stream. The ice gorging is principally caused by the fact that the break up takes place first in the head waters, bringing a rush of water to the lower portion of the stream before the influence of mild weather has been felt. In periods of freshet the river is bank full and it was found necessary to adopt a movable type of dam which would take care of the comparative large freshet discharge and not cause floods.

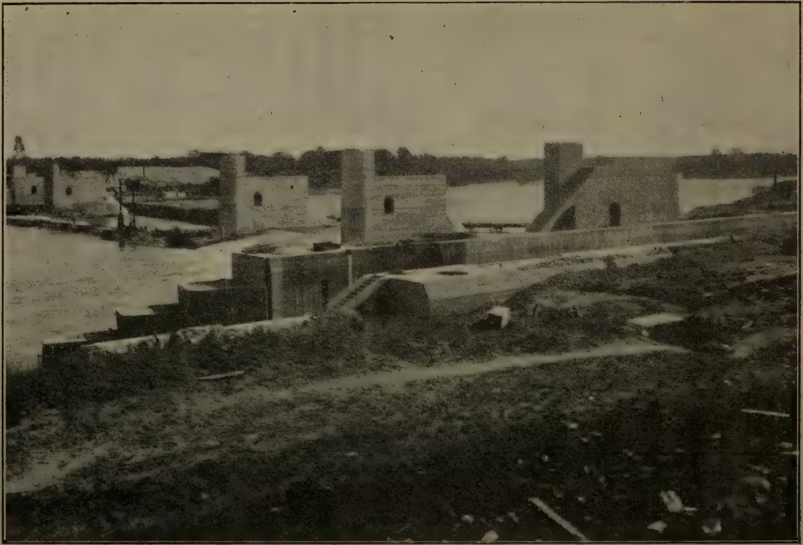
The Dam consists of a sub-structure or permanent dam of concrete on which is operated a movable dam, suspended from a service bridge.

The Dam is 788 feet in length between abutments, consisting of six spans of 119 ft., 8 in., and five piers of 14 feet in width.

Altogether, some 25,000 cubic yards of concrete have been used in the construction of the Dam. The Dam was built in sections, a portion of the river bed being unwatered at a time, excavation being carried down into a solid stratum of rock. The closure in the Dam was effected by diverting the stream over two spans of the completed portion. It is interesting to note that the greater portion of this work was constructed during the last two winters under conditions of temperature that varied as low as 45 degrees Fahr. below zero (–42.8° Cent.). For this purpose, the work was housed in and heated, and at no time were temperatures observed, in the work, below freezing point.

The movable dam is the first of its type constructed in America, and has for its prototype the Cameré curtain dam at Poses, on the Seine, France.

The general principles and mode of operating this dam are as follows:—



Construction of Dam, St. Andrews Locks, Red River.

Curtains consisting of wooden battens, hinged together by brass links, are supported by frames suspended from a bridge.

The curtains have for their base a rolling, cast-iron shoe of the form of an archimedean spiral, and they are rolled by an endless chain by means of a travelling windlass. The curtains have any lateral travel limited by guides in the supporting frames.

The supporting frames are suspended by joints to the lower floor of the bridge. They are formed of built-up members and have their lower ends resting against large cast steel step castings, embedded in the concrete.

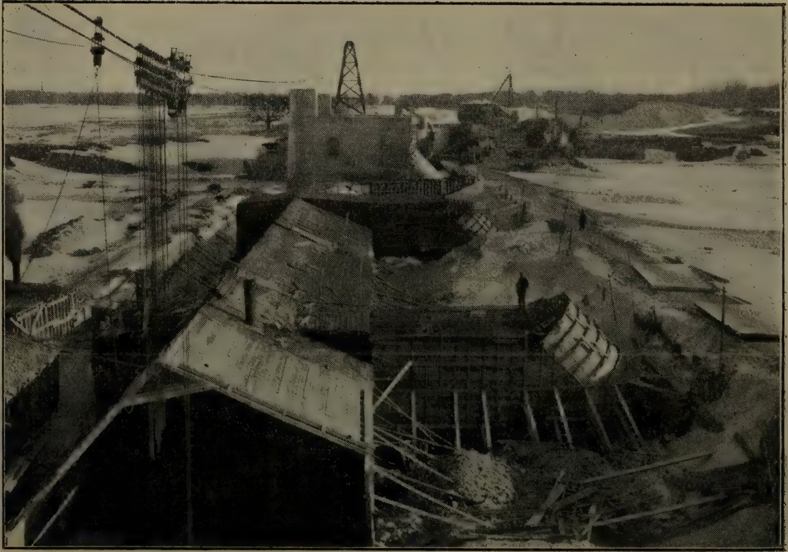
The frames are raised and lowered by means of travelling electric cranes operated from the service floor.

The Permanent Dam will raise the upper level 7 feet, and the further raise of 14 feet will be accomplished by means of the curtain dam.

At the end of the navigable season, the curtains are rolled up, removed, and stored away, and the curtain frames are raised, leaving unobstructed passage for the ice and spring freshet.

On the upper deck there will be a general traffic highway floor of reinforced concrete and a bascule lift will be erected over the lock chamber.

On the east side of the river a repair shop is being erected with a complete equipment to perform all necessary field repairs.



Construction of Dam during Winter, St. Andrews Locks, Red River.

It is expected that the work will be completed this fall and will be in operation on the opening of navigation next spring.

The following are some of the critical elevations, referred to sea level datum plane:—

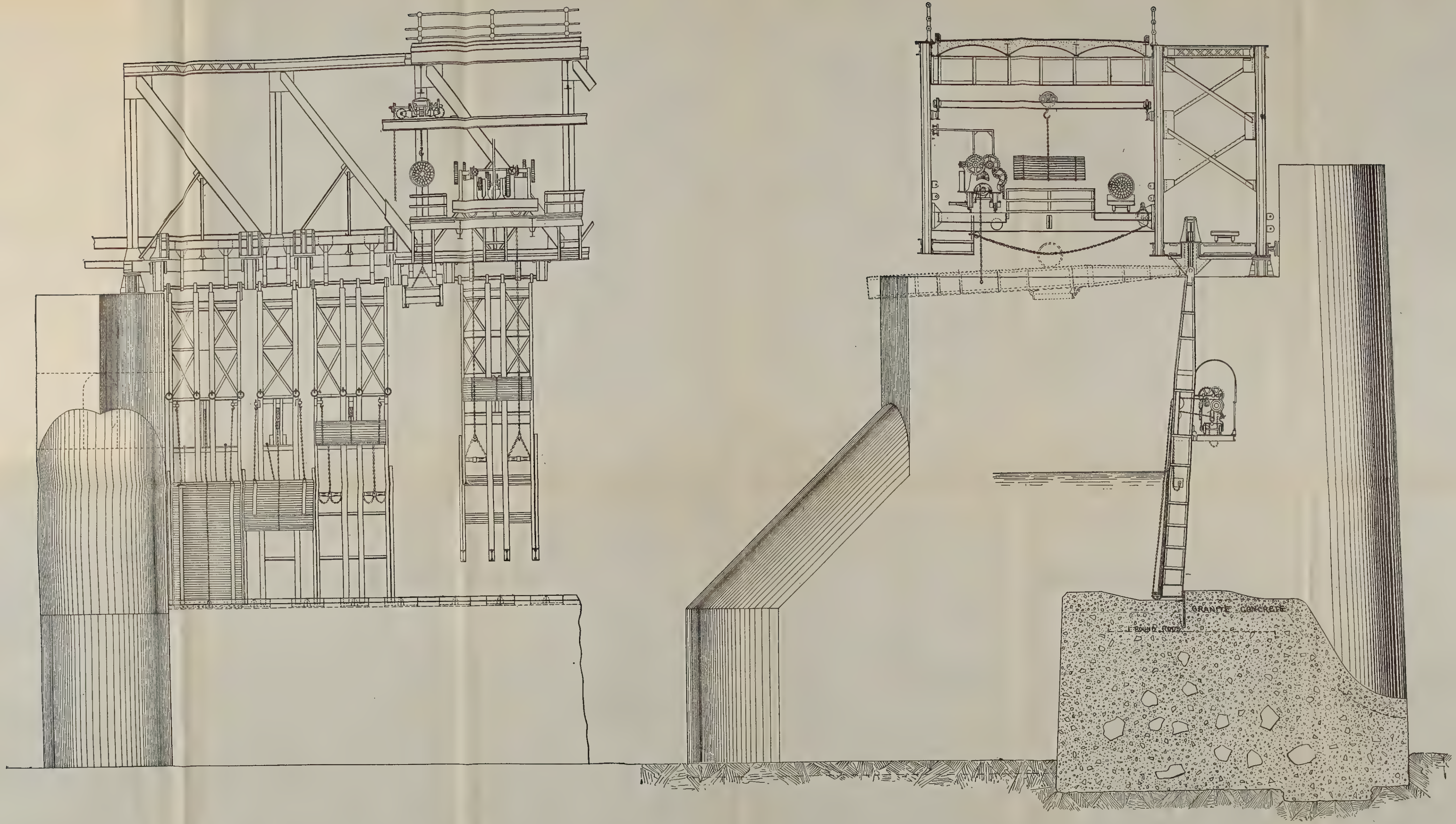
Lower pool—low water	El. 682.0
Upper pool—maintained level	El. 703.0
Lower mitre sill of lock	El. 672.0
Upper mitre sill of lock	El. 686.0
Crest of permanent dam	El. 690.5
Working floor of service bridge	El. 730.6
Highway floor of bridge	El. 748.9

In view of the remarkable progress now being made in the opening up and development of the varied resources of this great Western country, it is perhaps not difficult to foresee, in the completion of the St. Andrews Lock and Dam, a serious consideration of the valuable importance of our inland waterways and their development, in the near future, as natural highways of commerce.

Of particular interest are the possibilities of the development of the Saskatchewan River, from the foot hills of the Rocky Mountains to Lake Winnipeg, and thence, by way of the Nelson River, to the Hudson Bay.

A. R. DUFRESNE,
District Engineer.

WINNIPEG,
AUGUST 19TH, 1909.



PUBLIC WORKS - CANADA

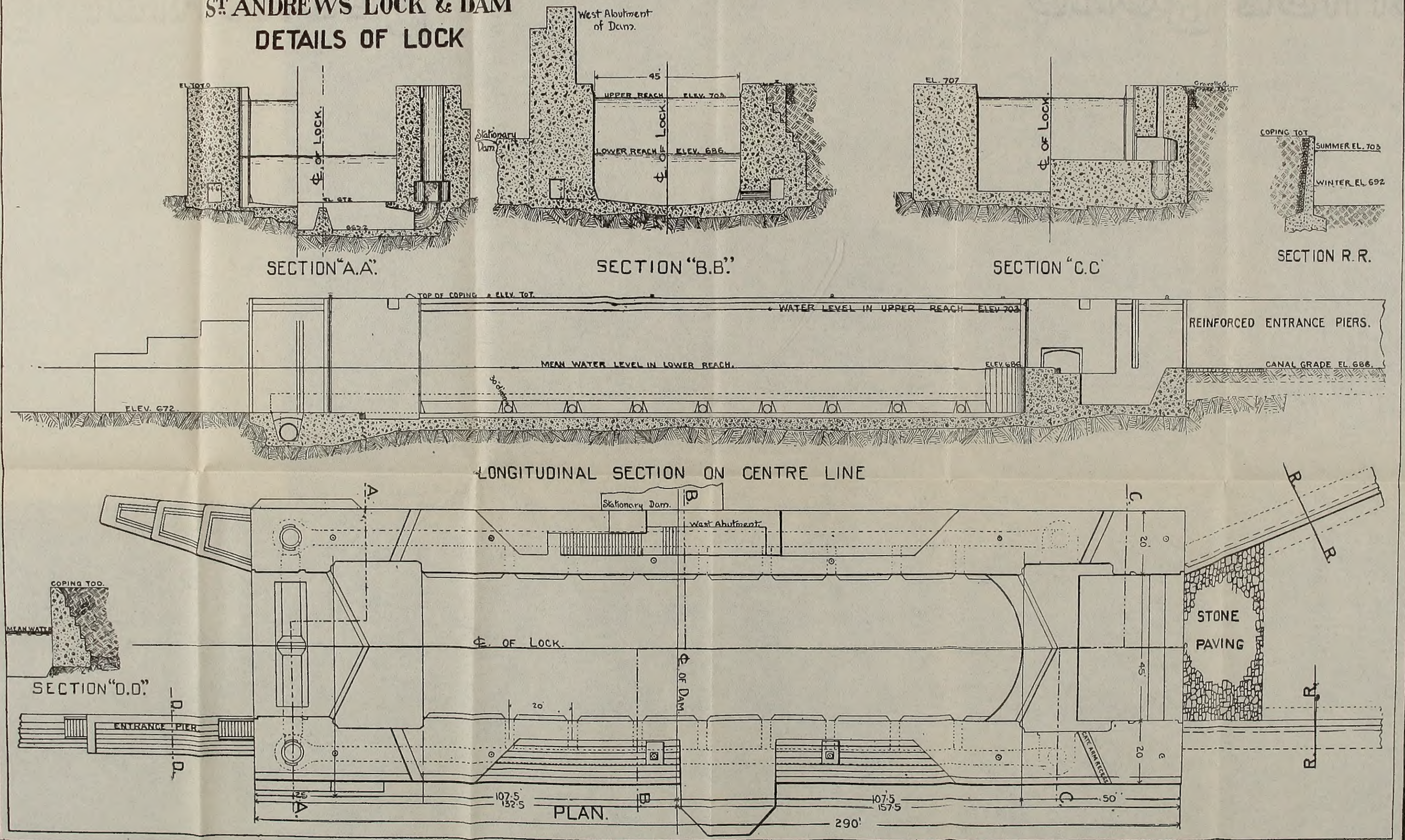
ST ANDREWS RAPIDS
MANITOBA
MOVABLE DAM

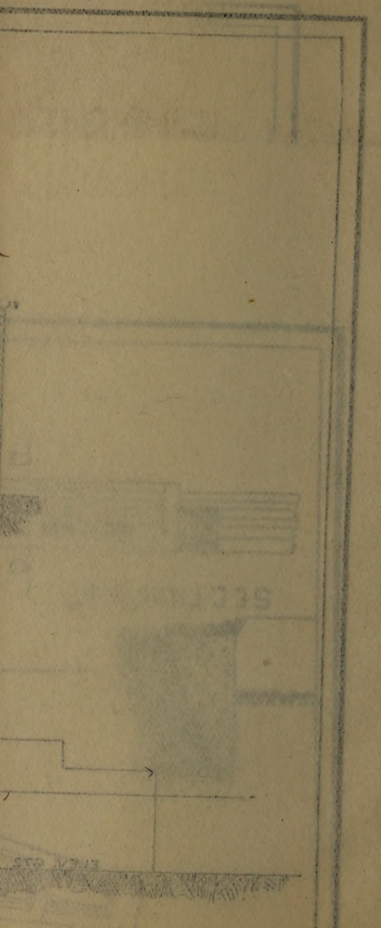
Scale : ¼ inch = 1 foot.

PUBLIC WORKS, CANADA

ST. ANDREWS LOCK & DAM

DETAILS OF LOCK





Time Table

2 p.m., Special Train leaves Winnipeg,
C.P.R. Depot.
2.30 p.m., Arrive Gonor.

4.30 p.m., Special Train leaves Gonor.
5 p.m, Arrive Winnipeg

Return Fare 45 cents.

The number of the Party is limited to 150.